CERTIFICATION OF TRANSLATION

I, Sungmi Park, an employee of Y.P.LEE, MOCK & PARTNERS of The Cheonghwa Bldg., 1571-18 Seocho-dong, Seocho-gu, Seoul, Republic of Korea, hereby declare under penalty of perjury that I understand the Korean language and the English language; that I am fully capable of translating from Korean to English and vice versa; and that, to the best of my knowledge and belief, the statements in the English language in the attached translation of the priority document (Korean Patent Application No. 02-82672), consisting of 23 pages, have the same meanings as the statements in the Korean language in the original document, a copy of which I have examined.

Signed this 12 day of October, 2004

Sungmi Park

Sungmi Park

ABSTRACT

[Abstract of the Disclosure]

A protection tape removing apparatus used in a semiconductor packaging process and a method of assembling a semiconductor package are disclosed. In the method and apparatus, after a wafer to which a protection tape is adhered is sawed to be divided into individual chips and then a frame for manufacturing a semiconductor package is attached to the individual chips, the protection tape is individually removed from the individual chips. The wafer can be divided into the individual chips without any damage caused to the chips by performing a die attaching process in a state where the protection tape is not removed.

[Representative Drawing]

FIG. 12

[Index Term]

Division of chips, Protection tape, Individual chip, Pressure pin, Pressure roller

SPECIFICATION

[Title of the Invention]

Protection tape removing apparatus and method of assembling semiconductor package using the same

[Brief Description of the Drawings]

FIGS. 1 through 4 are a cross-sectional view and perspective views for explaining a conventional method of assembling a semiconductor package;

FIG. 5 is a flowchart for explaining a conventional method of assembling a semiconductor package;

FIG. 6 is a flowchart for explaining a method of assembling a semiconductor package according to the present invention;

FIGS. 7 through 10 are cross-sectional views for explaining a method of assembling a semiconductor package according to the present invention;

FIGS. 11 and 12 are cross-sectional views for explaining a protection tape removing apparatus according to the present invention; and

FIG. 13 is a cross-sectional view for explaining a protection tape removing apparatus according to the present invention.

< Explanation of Reference numerals designating the Major Elements of the Drawings >

200; Adhesive tape	202; Jig
204`; Individual chip	206, 206`; Protection tape
208; Blade	210; Frame
212; UV lamp	302; Body
304; Supply roll	306; Winding roll
308; Release tape	310; Pressure pin
312; Guide roller	314; Pressure roller
316; Pressure surface	

[Detailed Description of the Invention]

[Object of the Invention]

[Technical Field of the Invention and Related Art prior to the Invention]

The present invention relates to a protection tape removing apparatus used in a semiconductor packaging process and a method of assembling a semiconductor package, and more particularly, to a method of assembling a semiconductor package which performs a die attaching process in a state where a protection tape is not removed and then removes the protection tape from individual chips, and a protection tape removing apparatus used in a semiconductor packaging process.

Generally, steps for manufacturing semiconductor devices are schematically classified into a step for fabricating semiconductor chips, a step for packaging the semiconductor chips, and a step for testing the semiconductor package. The packaging step includes a step for sawing a wafer to divide the semiconductor elements formed in the wafer into individual chips, a die attaching step for respectively attaching the individual chips to die pads of a leadframe, a wire-bonding step for electrically connecting bonding pads of the individual chips to leads of the leadframe, a step for molding the individual chips with a molding compound, a soldering step for plating the leads projected outward from the molding compound, and a singulation step for bending/cutting the soldered leads into a desirable shape to divide into discrete packages.

Hereinafter, a method of assembling a semiconductor package will be described with reference to FIGS. 1 through 4 which are a cross-sectional view and perspective views for explaining a conventional method of assembling a semiconductor package.

Referring to FIGS. 1 through 4, a protection tape 12 is adhered to an upper surface of a wafer 10 for protecting a circuit area. Thereafter, a back side grinding process is performed, and the wafer 10 is fixed to a jig (not shown) by an adhesive tape 24. The protection tape 12 is removed. The jig to which the wafer 10 is fixed is transferred to a wafer sawing equipment 50 by a transfer equipment (not shown). Thereafter, the wafer 10 is loaded onto a vacuum plate 22 of a main body 20 of the

wafer sawing equipment 50. Here, the adhesive tape 24 prevents individual chips 10' from being detached during the wafer sawing process.

A blade 28 is disposed on an upper portion of the main body 20. The blade 28 saws the wafer 10 along scribe lines 26 formed on an upper surface of the wafer 10 to divide the wafer 10 into the individual chips 10'. The blade 28 moves down toward the wafer 10, contacts the scribe lines 26 of the wafer 10, and simultaneously rotates by a rotation motor (not shown). As shown in FIG. 2B, the sawed wafer 10 is divided into the individual chips 10' due to the rotation motion of the blade 28, thereby completing the wafer sawing process.

After the wafer 10 is divided into the individual chips 10', the wafer 10 is transferred to a die attaching equipment (not shown). A pick-up collet 30 mounted in a die attaching equipment moves above the individual chips 10'. The pick-up collet 30 which contacts the individual chips 10' vacuum-sucks the individual chips 10' to detach the individual chips 10' from the adhesive tape 24. The individual chips 10' are attached to chip pads of a frame 40 for manufacturing a semiconductor package by the die attaching equipment. Sequentially, a curing process is performed for curing an epoxy adhesive, thereby completing the die attaching process.

FIG. 5 is a flowchart for explaining a conventional method of assembling a semiconductor package. As shown in FIG. 5, the protection tape 12 is adhered to the upper surface of the wafer 10 in step S60. Next, the wafer 10 is fixed to the jig by the adhesive tape 24 in step S65. The protection tape 12 is removed in step S70. The wafer 10 is sawed to be divided into the individual chips 10' in step S75. The die attaching process for the individual chips 10' is performed in step S80.

However, when the individual chips 10' are detached from the adhesive tape 24 by the pick-up collet 30, a crack occurs in the individual chips 10'. Particularly, in a case where the back side grinding process for the wafer 10 is performed to make the thickness of the wafer 10 thin in order to apply the wafer 10 to a Thin Quad Flat Package (TQFP) and a Thin Small Outline J-lead (TSOJ), the occurrence frequency of the crack increases. That is, the thinner the wafer is the more frequently the crack

occurs. Further, the greater the size of the chip is the more frequently the crack occurs.

[Technical Goal of the Invention]

The present invention provides a method of assembling a semiconductor package without any damage caused to a semiconductor chip.

The present invention also provides a protection tape removing apparatus used in a semiconductor packaging process without any damage caused to a semiconductor chip.

[Structure and Operation of the Invention]

According to an aspect of the present invention, there is provided a method of assembling a semiconductor package. The method comprises adhering a protection tape to an upper surface of a wafer for protecting a circuit area; attaching the wafer to a jig, an adhesive tape for supporting the wafer being adhered to a lower portion of the jig; sawing the wafer to discretely divide into individual chips; attaching the individual chips to a frame for manufacturing the semiconductor package; decreasing the adhesion of the protection tape on the frame; and removing the protection tape from the individual chips.

According to the method of assembling the semiconductor package, the thickness of the wafer is 200 μm or less.

According to the method of assembling the semiconductor package, the frame is a leadframe for using leads as an external connection terminal, or a substrate for using solder balls as an external connection terminal.

According to the method of assembling the semiconductor package, the adhesion of the protection tape is decreased by an ultraviolet ray or heat. Further, it is preferable that the protection tape is transparent so that a pattern of the individual chips can be recognized. It is preferable that the thickness of the protection tape is 500 μm or less. It is preferable that the thinner the wafer is the thinner the protection tape is, or the thicker the wafer is the thicker the protection tape is.

According to the method of assembling the semiconductor package, the protection tape is removed from each of the individual chips by pressing a release tape, to which an adhesive is coated, using a pressure pin or a pressure roller having a smooth pressure surface.

According to another aspect of the present invention, there is provided a protection tape removing apparatus comprising a body for loading a frame for manufacturing a semiconductor package to which individual chips, to which a protection tape is adhered, are attached; a release tape, which is located on an upper portion of the frame and attached to an upper surface of the protection tape to remove the protection tape; pressure means for adhering the release tape to the protection tape; a supply roll, which is located on the upper portion of the frame and supplies the release tape; and a winding roll, which is located on the upper portion of the frame and winds the release tape.

According to the protection tape removing apparatus, the pressure means is a pressure pin for pressing the protection tape against the release tape by moving downward. Further, the pressure means is a pressure roller having a pressure surface for pressing the protection tape against the release tape by the rotation of the pressure roller.

The protection tape removing apparatus may further comprise a guide roller for maintaining the tension of the release tape between the supply roll and the winding roll.

Preferred embodiments of the present invention will now be described with reference to the attached drawings.

This invention may, however, be embodied in many different forms and should not be construed as being limited to the embodiments set forth herein. Rather, these embodiments are provided so that this disclosure will be thorough and complete and will fully convey the concept of the invention to those skilled in the art. In the drawings, the shapes of elements, etc. are exaggerated for clarity. When the same reference numeral appears in more than one drawing, it denotes the same element.

For the convenience of explanation, the embodiments of the present invention will be described separating a method of assembling a semiconductor package and a protection tape removing apparatus.

Method Of Assembling Semiconductor Package

FIG. 6 is a flowchart for explaining a method of assembling a semiconductor package according to the present invention, and FIGS. 7 through 10 are cross-sectional views for explaining a method of assembling a semiconductor package according to the present invention.

As shown in FIGS. 6 through 10, a protection tape 206 is adhered to an upper surface of a wafer 204 in step S100. Sequentially, the wafer 204 is fixed to a jig 202 by an adhesive tape 200 in step S110. The wafer 204 is sawed to be divided into individual chips 204' in step S120. A die attaching process for the individual chips 204' is performed in step S130. Next, protection tapes 206', which are divided portions of the protection tape 206 divided by the wafer sawing process and are respectively adhered to upper surfaces of the individual chips 204', are removed in step S140. The present invention is different from the prior art in that the die attaching process is performed in a state where the divided protection tapes 206' are not removed.

Referring to FIGS. 7 through 10, the protection tape 206 is adhered to the upper surface of the wafer 204 for protecting a circuit area. Sequentially, a back side grinding process is performed, and the wafer 204 is fixed to the jig 202 by the adhesive tape 200. The jig 202 to which the wafer 204 is fixed is transferred to a wafer sawing equipment (refer to FIG. 2) by a transfer means (not shown). Thereafter, the wafer 204 is divided into the individual chips 204' by a blade 208. Here, the adhesive tape 200 prevents the individual chips 10' from being detached during the wafer sawing process.

The protection tape 206 is constructed such that a component in which the adhesion is adjusted is coated on a base film by heat or an ultraviolet (UV) ray. In the present invention, a UV tape is used as the protection tape 206. In a case where the UV tape is used as the protection tape 206, a foreign adhesive material almost does not

exist in the individual chips 204' in comparison to different kinds of tapes, after removing the protection tape 206.

It is preferable that the protection tape 206 is transparent in order for a patterns of the upper surfaces of the individual chips 204' to be easily recognized during the wafer sawing process. Further, the protection tape 206 having a thickness of 500 μm or less is used, in order to prevent a damage of the individual chips 204' when the individual chips 204' are detached from the adhesive tape 200. For example, if the size of the chip is small, thin protection tape 206 is used, and if the size of the chip is large, thick protection tape 206 is used.

After the wafer 204 is divided into the individual chips 204', a pick-up collet (refer to FIG. 3A) mounted in a die attaching equipment (not shown) moves above the individual chips 204'. The pick-up collet which contacts the individual chips 204' vacuum-sucks the individual chips 204' to detach the individual chips 204' from the adhesive tape 200. The individual chips 204' are attached to chip pads of a frame 210 for manufacturing a semiconductor package by the die attaching equipment. Next, a curing process is performed for curing an epoxy adhesive, thereby completing the die attachment process. The frame 210 for manufacturing the semiconductor package may be a leadframe using leads as an external connection terminal or a substrate using solder balls as an external connection terminal. The curing process may be performed after removing the divided protection tapes 206', if necessary.

Next, the adhesion of the protection tapes 206' is decreased due to heat or a UV ray. A UV lamp 212 is used to decrease the adhesion of the protection tapes 206' consisting of the UV tape. For example, a quantity of light of 500 joule generated from a mercury lamp is irradiated on the protection tapes 206' having the thickness of 130 μm - 150 for about 8 seconds. Photo initiator among constituents consisting of an adhesive agent of the UV tape reacts to harden neighbor adhesive constituents so that the adhesion of the UV is decreased. The divided protection tapes 206' whose adhesion has decreased are removed from the individual chips 204' by a protection tape removing apparatus which will be described below.

Preferably, the thickness of the wafer 204 is 200 μm or less. The thickness of the wafer 204 used in the present invention was 50 μm. Thus, the chips can be divided from the wafer in a semiconductor packaging process without any damage caused to the chips.

Protection Tape Removing Apparatus

FIGS. 11 and 12 are cross-sectional views for explaining a protection tape removing apparatus according to the present invention.

Referring to FIGS. 11 and 12, the removing apparatus includes a body 302 for accommodating the frame 210 to which the individual chips 204', to which the protection tapes 206' are adhered, are attached, a release tape 308 which is located on the upper portion of the frame 210 and is attached to the upper surfaces of the protection tapes 206', pressure means for adhering the release tape 308 to the protection tapes 206', a supply roll 304 which is located on the upper portion of the frame 210 and supplies the release tape 308, a winding roll 306 which is located on the upper portion of the frame 210 and winds the release tape 308, and a guide roller 312 for maintaining the tension of the release tape 308 between the supply roll 304 and the winding roll 306.

The pressure means may be a pressure pin 310 for pressing the protection tapes 206' against the release tape 308, and a pressure roller 314 having a smooth pressure surface 316 for pressing the protection tapes 206' against the release tape 308 by the rotation of the pressure roller 314. The cross-sectional area of the pressure pin 310 and the area of the pressure surface 316 may depend on the size of the individual chips 204'. An adhesive is coated to one surface of the release tape 308 to which the protection tapes 206' are adhered.

The method of removing the protection tapes 206' will now be described. The supply roll 304 supplies the release tape 308. The release tape 308 is wound around the winding roll 306 while being supported by the guide roller 312. In a case where the pressure means is the pressure pin 310, the pressure pin 310 moves downward, presses the release tape 308, and adheres the release tape 308 to the protection tapes

206'. If the pressure pin 310 moves upward, the protection tapes 206' are removed according to the movement of the release tape 308.

In a case where the pressure means is the pressure roller 314, the pressure roller 314 adheres the protection tapes 206' to the release tape 308 pressed by the pressure surface 316 due to the rotation of the pressure roller 314. The protection tapes 206' are removed according to the movement of the release tape 308 toward the winding roll 306. The above method is effective in a case where the plurality of chips 204' are formed on the frame 210. On occasion, the center of the rotation of the pressure roller 314 may be eccentric. The diameter and the rotation speed of the pressure roller 314 may be appropriately set as needed.

Modification

Although the method of removing the protection tape using the release tape was described in the present invention, it is not limited thereto and various changes in form and details may be made therein.

FIG. 13 is a cross-sectional view for explaining a protection tape removing apparatus according to the present invention.

Referring to FIG. 13, the protection tape removing apparatus includes a body 302 for loading the frame 210 to which the individual chips 204', to which the protection tapes 206' are adhered, are attached, and a vacuum suction unit 318. The vacuum suction unit 318 moves toward the protection tapes 206' whose adhesion has decreased due to a UV ray or heat. Next, the vacuum suction unit 318 sucks the protection tapes 206'. On occasion, the vacuum suction unit 318 of two or more may be mounted in the die attaching equipment.

While the present invention has been particularly shown and described with reference to preferred embodiments thereof, it will be understood by those of ordinary skill in the art that various changes in form and details may be made therein without departing from the spirit and scope of the present invention as defined by the appended claims.

[Effect of the Invention]

As described above, according to the present invention, a wafer can be divided into individual chips without any damage caused to the chips by performing a die attaching process in a state where a protection tape is not removed.

What is claimed is:

1. A method of assembling a semiconductor package, comprising:

adhering a protection tape to an upper surface of a wafer for protecting a circuit area;

attaching the wafer to a jig, an adhesive tape for supporting the wafer being adhered to a lower portion of the jig;

sawing the wafer to discretely divide into individual chips;

attaching the individual chips to a frame for manufacturing the semiconductor package;

decreasing the adhesion of the protection tape on the frame; and

removing the protection tape from the individual chips on the frame.

2. The method of claim 1, wherein a back side grinding process for the wafer is further performed after adhering the protection tape to the wafer.

3. The method of claim 1, wherein the thickness of the wafer is 200 μm or less after the back side grinding process.

4. The method of claim 1, wherein the frame is a leadframe for using leads as an external connection terminal.

5. The method of claim 1, wherein the frame is a substrate for using solder balls as an external connection terminal.

6. The method of claim 1, wherein the adhesion of the protection tape is decreased by an ultraviolet ray.

7. The method of claim 1, wherein the adhesion of the protection tape is decreased by heat.

8. The method of claim 1, wherein the protection tape is transparent so that a pattern of the individual chips can be recognized.

9. The method of claim 1, wherein the thickness of the protection tape is 500 μm or less.

10. The method of claim 9, wherein the thinner the wafer is the thinner the protection tape is.

11. The method of claim 9, wherein the thicker the wafer is the thicker the protection tape is.

12. The method of claim 1, wherein the protection tape is removed from the individual chips by a vacuum suction method.

13. The method of claim 1, wherein the protection tape is removed from the individual chips by pressing a release tape, to which an adhesive is costed, by a pressure pin.

14. The method of claim 1, wherein the protection tape is removed from each of the individual chips by pressing the release tape, to which the adhesive is coated, using a pressure roller having a smooth pressure surface.

15. A protection tape removing apparatus comprising:

a body for loading a frame for manufacturing a semiconductor package to which individual chips, to which a protection tape is adhered, are attached;

a release tape which is located on an upper portion of the frame and is attached to an upper surface of the protection tape to remove the protection tape;

pressure means for adhering the release tape to the protection tape;

a supply roll which is located on the upper portion of the frame and supplies the release tape; and

a winding roll which is located on the upper portion of the frame and winds the release tape.

16. The protection tape removing apparatus of claim 15, wherein an adhesive is coated to one surface of the release tape.

17. The protection tape removing apparatus of claim 15, wherein the pressure means is a pressure pin for pressing the protection tape against the release tape by moving downward.

18. The protection tape removing apparatus of claim 15, wherein the pressure means is a pressure roller having a smooth pressure surface for pressing the protection tape against the release tape by the rotation of the pressure roller.

19. The protection tape removing apparatus of claim 15, further comprising a guide roller for maintaining the tension of the release tape between the supply roll and the winding roll.

FIG. 1

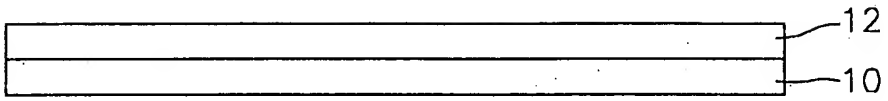

FIG. 2A

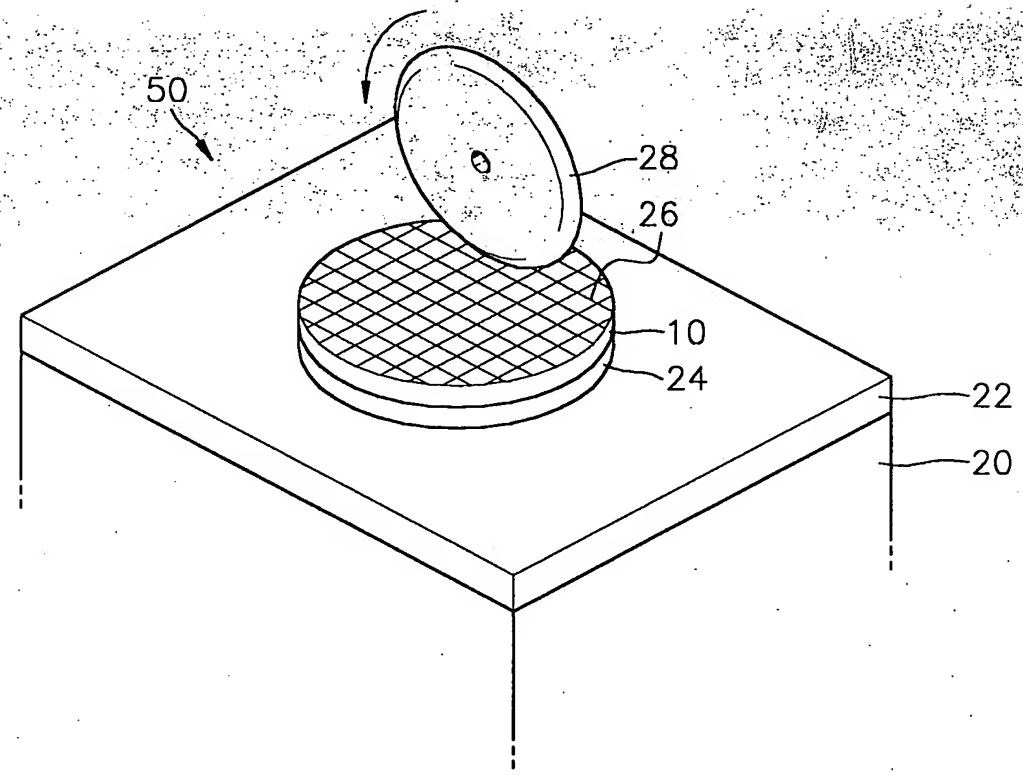

FIG. 2B

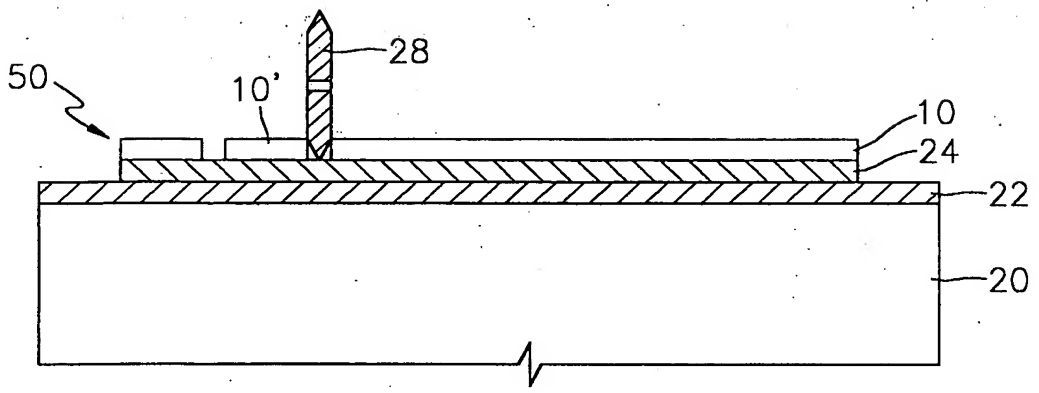

FIG. 3A

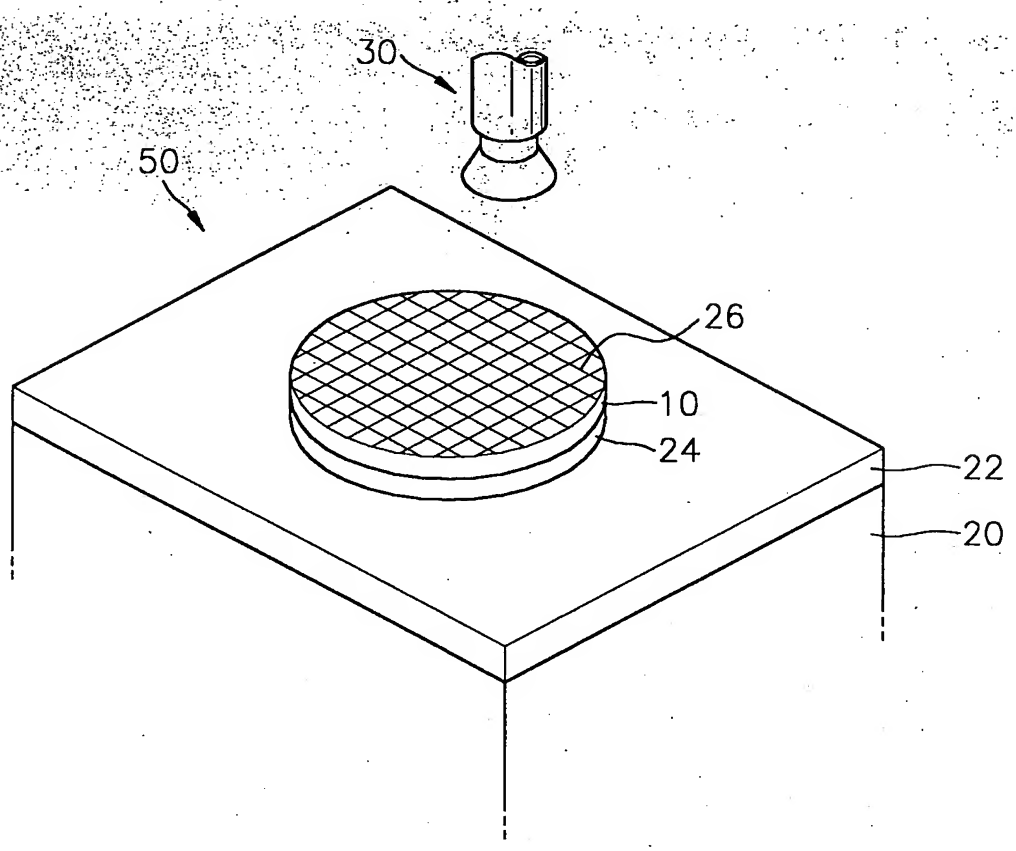

FIG. 3B

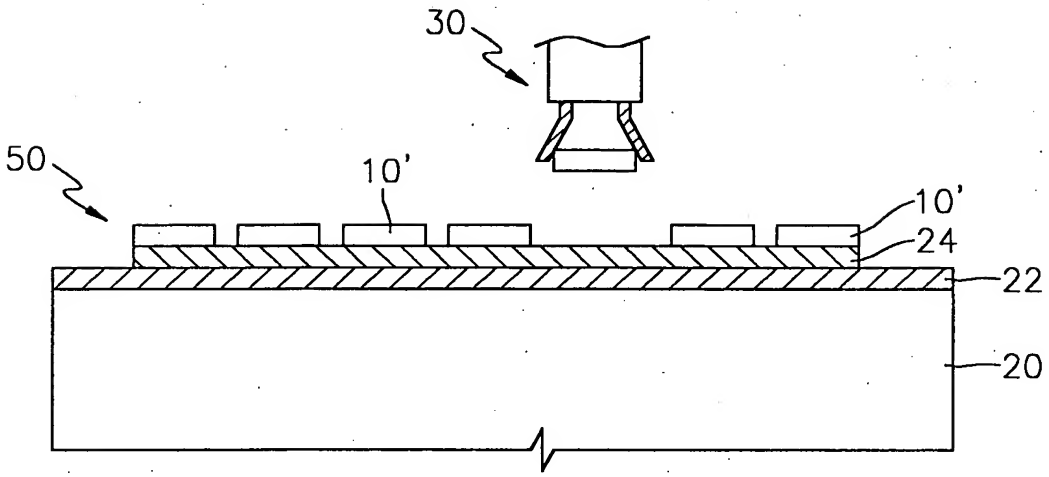

FIG. 4

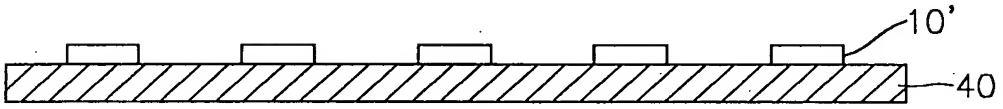

FIG. 5

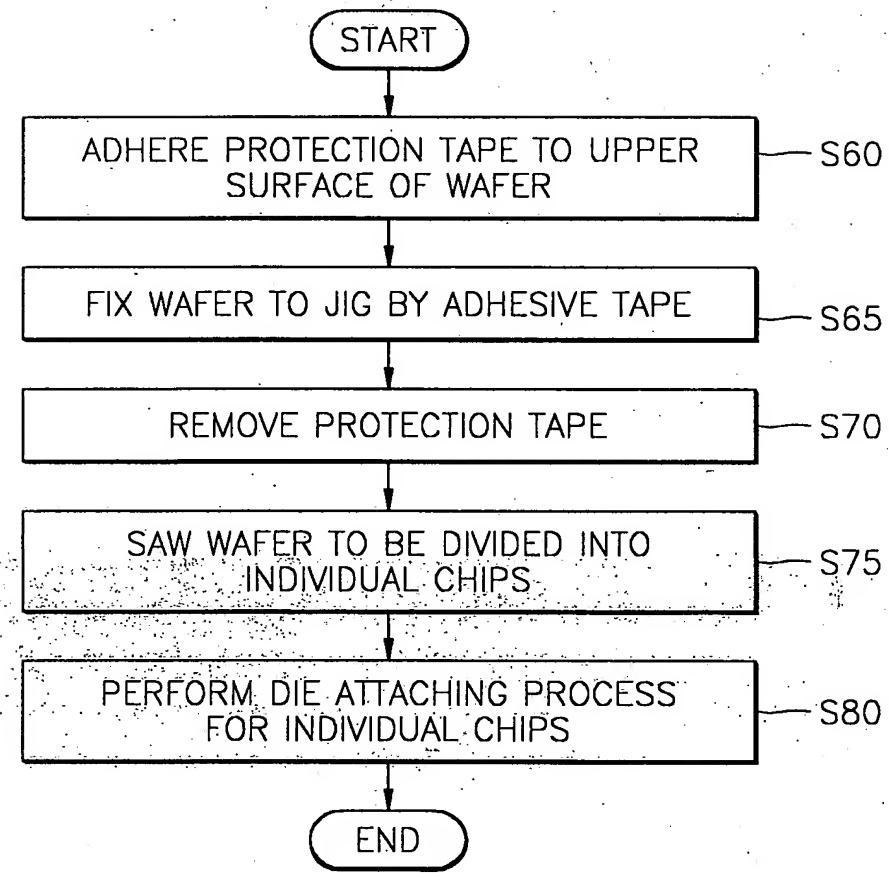
START
ADHERE PROTECTION TAPE TO UPPER SURFACE OF WAFER
S60
FIX WAFER TO JIG BY ADHESIVE TAPE
S65
REMOVE PROTECTION TAPE
S70
SAW WAFER TO BE DIVIDED INTO INDIVIDUAL CHIPS
S75
PERFORM DIE ATTACHING PROCESS FOR INDIVIDUAL CHIPS
S80
END

FIG. 6

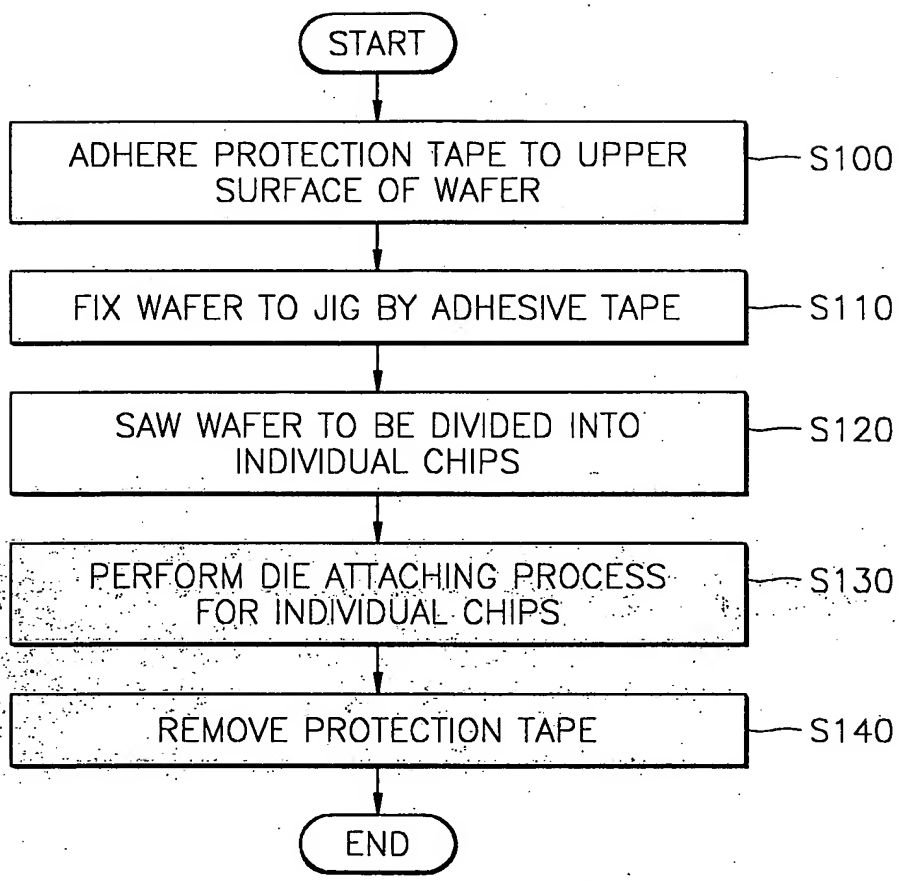
START
ADHERE PROTECTION TAPE TO UPPER SURFACE OF WAFER
S100
FIX WAFER TO JIG BY ADHESIVE TAPE
S110
SAW WAFER TO BE DIVIDED INTO INDIVIDUAL CHIPS
S120
PERFORM DIE ATTACHING PROCESS FOR INDIVIDUAL CHIPS
S130
REMOVE PROTECTION TAPE
S140
END

FIG. 7

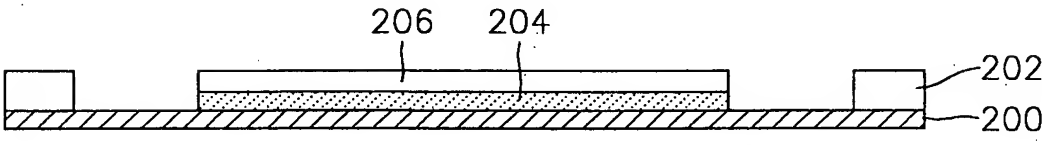
206
204
202
200

FIG. 8

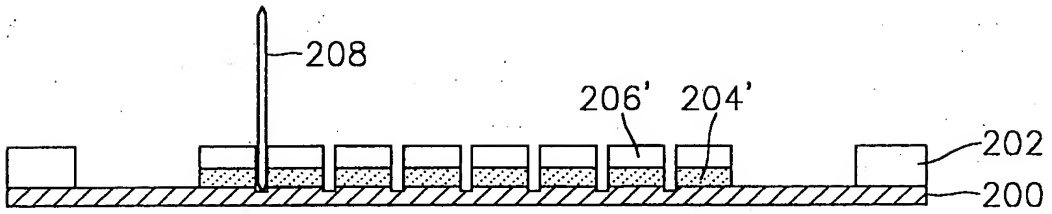

FIG. 9

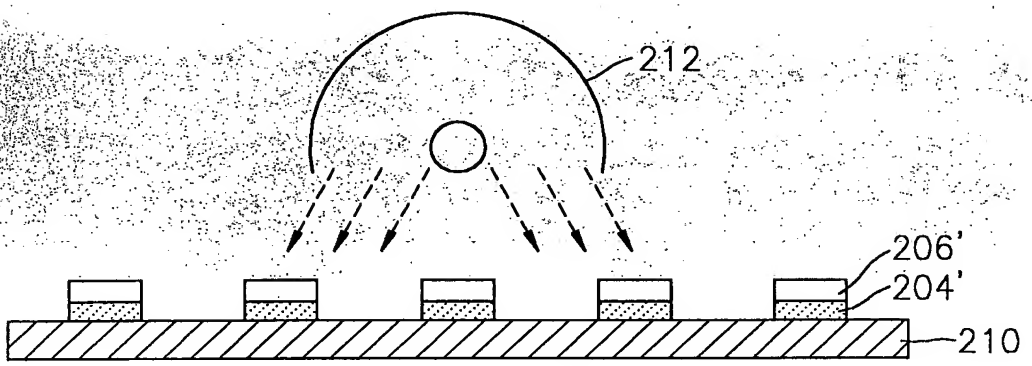

FIG. 10

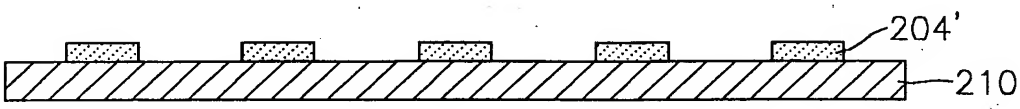

FIG. 11

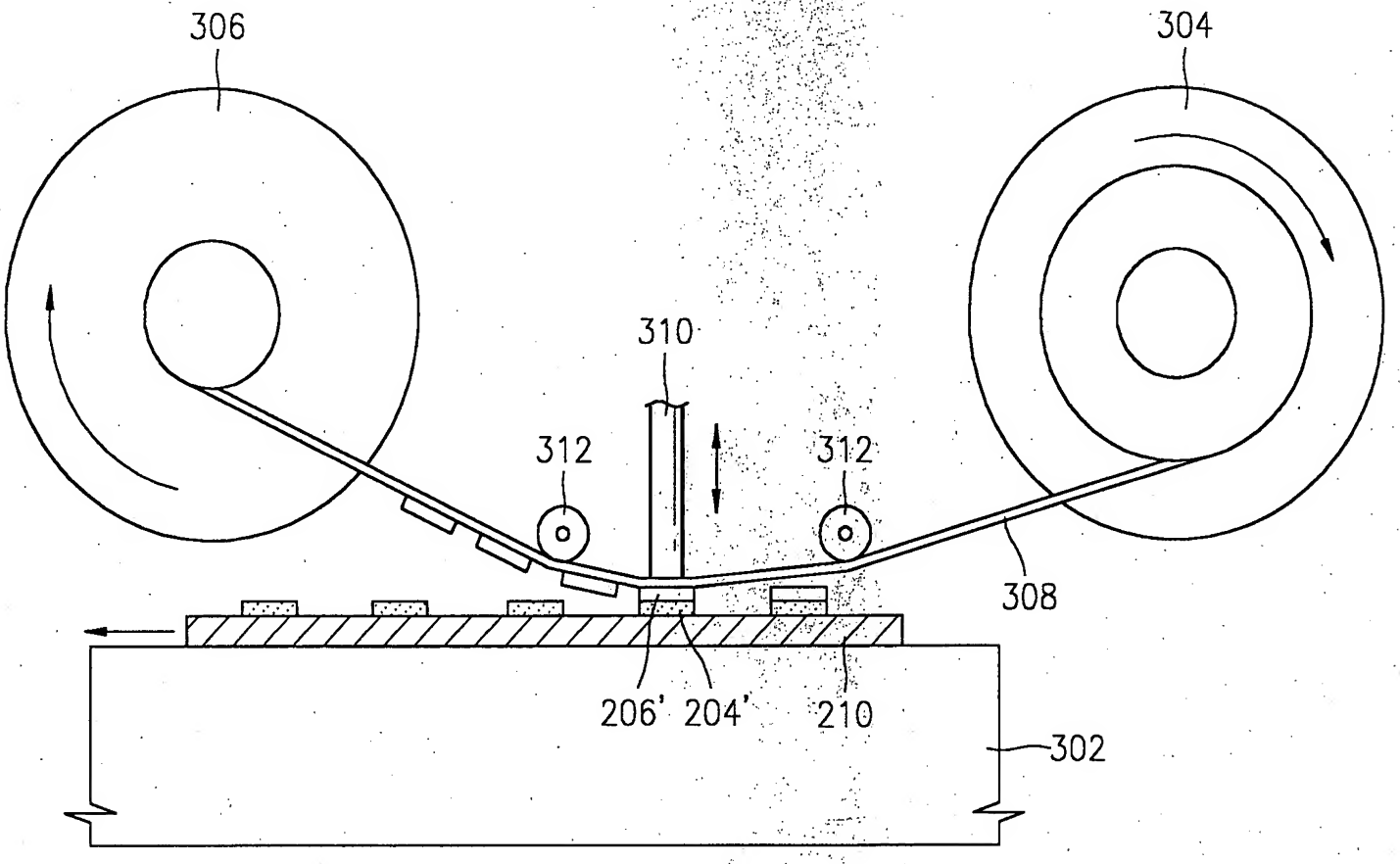

FIG. 12

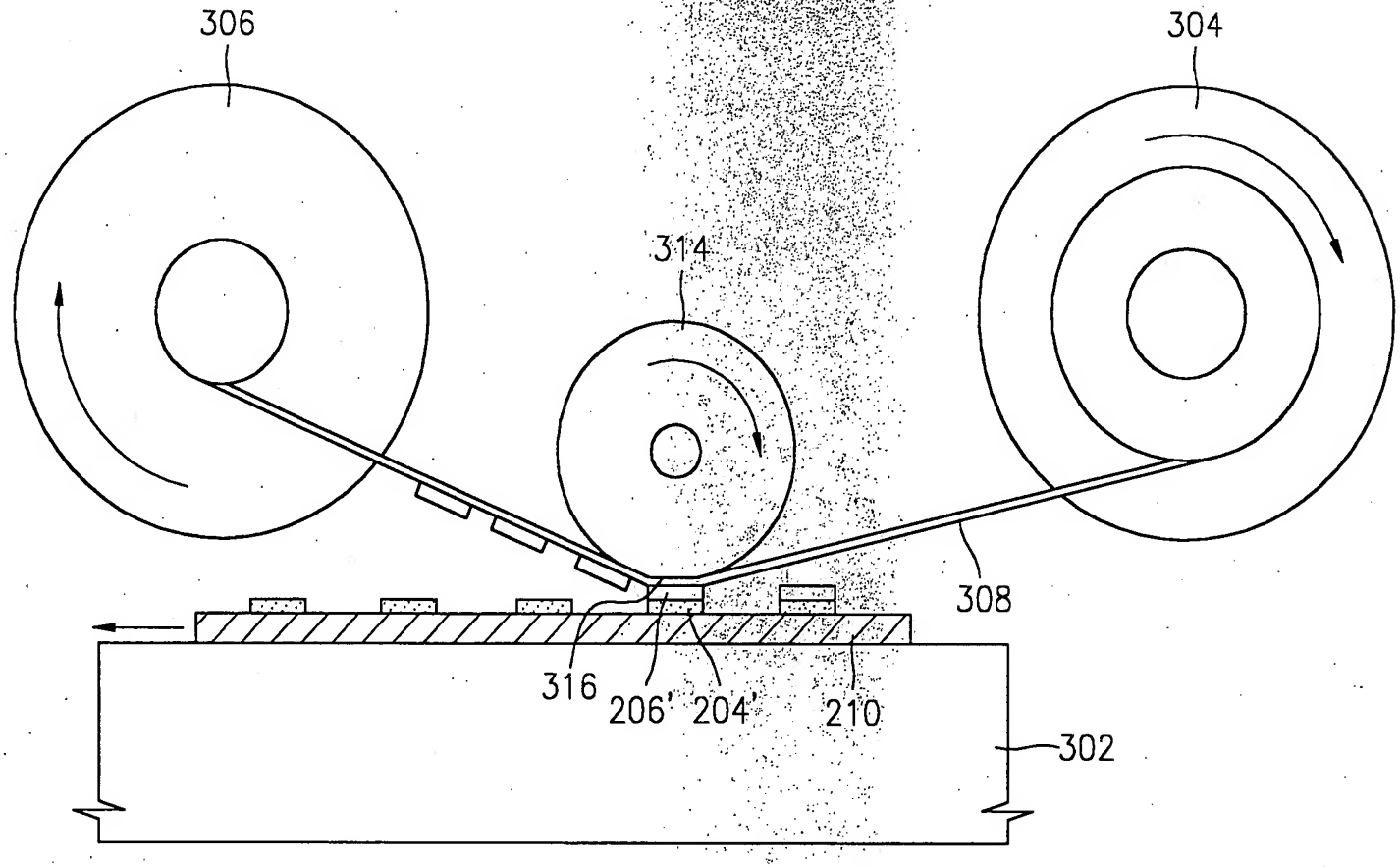

FIG. 13